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EXAMINER
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ALEJANDRO, RAYMOND

ART UNIT	PAPER NUMBER
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1745

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06/11/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/738,400

Applicant(s)

HYUNG ET AL.

Examiner

Raymond Alejandro

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 10 May 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 44-70 is/are pending in the application.
- 4a) Of the above claim(s) 47-69 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 44-46 and 70 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION*****Response to Amendment***

This office action is in response to applicant's amendment dated 05/10/07. The applicant has overcome most of the 35 USC 112 rejections and the 35 USC 102 rejection over Hall'993 as set forth in the non-final rejection of 11/22/06. Refer to the abovementioned amendment for specific details on applicant's rebuttal arguments and remarks. However, the present claims (new claims) are finally rejected over new grounds of rejection as presented hereinafter and for the reasons of record:

***Election/Restrictions***

1. Newly submitted claims 47-69 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: new claims 47-69 are directed to single (only one) lithium-based cells while original claims 1-20 were directed to a lithium electrochemical cell system comprising three specific lithium based cells. New claims 44-46 and 70 now encompass the scope original claims 1-20 and correspond, in part, to their subject matter. A first office action on the merits (See Non-Final Rejection dated 11/22/06) was issued to address the subject matter now encompassed by new claims 44-46 and 70. As now presented, the subject matter of new claims 44-46 and 70 (covering substantially the scope of original claims 1-20) and new claims 47-69 are related as combination-subcombination. The combination being the lithium electrochemical cell system including three specifically distinct lithium-based cells and the subcombination being any one of the single (only one) lithium based cell per se. In this case, restriction is proper because the subcombinations (i.e. specific lithium based electrochemical system) of claims 47, 61 and 66 are evidence that combination of claim 70 does

Art Unit: 1745

not require the particulars of the subcombination for patentability. For instance, the combination invention does not require a single cell system comprising lithium metal as part of the anode; or some of the specific electrolyte systems recited in claims 47, 61 and 66; and the combination has a separate utility of producing power by itself.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 47-69 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

#### ***Claim Disposition***

2. Claims 1-20 were cancelled.
3. Claims 21-43 were not entered. See office actions dated 02/01/07 and 04/06/07 and applicant's replies dated 12/21/06, 03/09/07 and 05/10/07 for more information.
4. Claims 47-69 have been withdrawn from consideration. See item 1 above.
5. Claims 44-46 and 70 are being examined on their merits.

#### ***Claim Objections***

6. Claim 44 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The subject matter of claim 44 does not appear to further limit the subject matter of independent claim 70. Further clarification is required.

***Double Patenting***

7. Applicant is advised that should claim 70 be found allowable, claim 44 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

***Claim Rejections - 35 USC § 112***

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claim 44-46 and 70 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

10. The language “electromechanical cell” in lines 2 and 10 of claim 70 (two occurrences) appears to be technically inaccurate as the claimed invention is related to electrochemical cell system for power generation rather than electromechanical cells. The limitation electromechanical cell is not consistent with the scope of the original claims as well as the content of the as-filed disclosure. Further clarification is required.

11. Claim 44 recites the limitation “a positive electrode” in line 2; “a negative electrode” in line 3 and “an electrolyte” in line 4. There is insufficient antecedent basis for this limitation in the claim. It is noted that claim 70 contains earlier recitations including first and second positive/negative electrodes; and first/second electrolytes.

Art Unit: 1745

12. Claim 44 recites the limitation "a crystalline carbon" in line 3. There is insufficient antecedent basis for this limitation in the claim. It is noted that claim 70 contains an earlier recitation thereof.

***Claim Rejections - 35 USC § 103***

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

15. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Frech et al 2002/0160271.

The present invention is directed toward a lithium electrochemical cell system wherein the disclosed inventive concept comprises the specific electrochemical cells and the degassing agent.

Art Unit: 1745

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

**Examiner's Note:** *since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is*



*contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Art Unit: 1745

16. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of Besenhard et al 6942949.

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended*

Art Unit: 1745

*that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the

Art Unit: 1745

cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

***Examiner's Note:** since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

Besenhard et al disclose a rechargeable lithium electrochemical cell comprising an electrolyte including a Li-salt, solvents and an additive such as 1,5 hexadiene (ABSTRACT/Col 2, lines 63-67/ COL 3, line 65-67).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Besenhard et al in the Li-battery cells of Hall-Smith et al-Frech et al because Besenhard et al disclose that the specific compound (the degassing agent) assists in the formation of a passivation layer on the cathodes, and sensitiveness of the battery against overcharge is reduced; and such an additive, when added in the electrolyte, does not deteriorates the properties of the battery anodes.

17. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of Abraham et al 4489145.

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The

Art Unit: 1745

invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents.

Art Unit: 1745

Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

**Examiner's Note:** *since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

Abraham et al disclose lithium cells comprising an additive in the non-aqueous electrolyte for improving the cycle life of the cell (ABSTRACT); said additive may be 2,4-dimethyl-1,3-pentadiene (COL 6, lines 51-65).



In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Abraham et al in the Li-battery cells of Hall-Smith et al-Frech et al because Abraham et al makes known that the use of said additive (the specific degassing agent) in the non-aqueous electrolyte improves the cycle life of the cell.

18. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of Lucas et al 3567601.

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Art Unit: 1745

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

**Examiner's Note:** *since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over

leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

Lucas et al disclose electrolytic processes in electrolytic cells (ABSTRACT) comprising electrolytes (COL 2, lines 43-48) comprising 2,3-dimethyl-1,3-butadiene (COL 2, lines 65-66).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Lucas et al in the Li-battery cells of Hall-Smith et al-Frech et al because Lucas et al disclose al that the specific compound (the degassing agent) assists in electrolytic process that occurs in the electrolytic cell. Thus, Lucas et al contemplate the desirability of including said specific compound in the electrolytic cell regardless of the particular chemical environment or functionality of the electrolytic cell. Lucas et al is pertinent to other references as well as the field of applicant's endeavor because Lucas et al envision the use of said specific compound in electrolytic cells, and batteries or electrochemical cell are also electrolytic-based systems.

Art Unit: 1745

19. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of Chen et al 20030157413.

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended*

Art Unit: 1745

*that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the

cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

***Examiner's Note:** since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

Chen et al disclose Li-ion batteries with improved safety (TITLE) that utilizes one or more additives in the battery electrolyte solution wherein a Li-salt is dissolved in an organic solvent containing propylene carbonate, and a blend of triphenyl phosphate and vinyl ethylene carbonate. This blend which is an additive has been found to significantly enhance the safety and performance of Li-ion batteries (ABSTRACT/Claims 1 and 11).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Chen et al in the Li-battery cells of Hall-Smith et al-Frech et al because Chen et al teach that their blend additive has been found to significantly enhance the safety and performance of Li-ion batteries.

20. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of Denton, III 5962168.

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The



Art Unit: 1745

invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents.

Art Unit: 1745

Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

**Examiner's Note:** *since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

Denton, III disclose electrochemical cells (TITLE/ABSTRACT) wherein, one alternative embodiment, the electrolyte solvent may be either a polymer blend or a co-polymer of low-

Art Unit: 1745

PVDF and one or more other low molecular weight polymers among poly(vinyl pyridine), and combinations thereof (COL 4, lines 22-30).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Denton, III in the Li-battery cells of Hall-Smith et al-Frech et al because Denton, III teach that their blend additive has many advantages as an electrolyte solvent of an electrochemical cell. It's thermodynamic stability (e.g., electrochemical stability) is independent of number average molecular weight; it is more miscible with other liquids than is high number average molecular weight PVDF; it can accommodate high concentrations of Li salt while allowing high Li ion diffusion rates, an important criteria for use in Li batteries. It will have good solvent-like miscibility and compatibility with high number average molecular weight PVDF (high-PVDF, i.e.). This is important since many lithium batteries now use high-PVDF, which is substantially a solid, as a binder in the electrodes of such cells. Finally, it melts well below room temperature, is not viscous, and is not volatile. It is a flame retardant which renders it a good choice for an electrolyte solvent, whether used alone or in combination with other solvents.

21. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of Kubota et al 5654114.

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon*,

*negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents.

Art Unit: 1745

Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

**Examiner's Note:** *since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

Kubota et al disclose that for the purpose of improving a variety of characteristics for the battery such as cyclic characteristics, an over-discharge suitability, and an over-charge suitability, the following ingredients may be optionally added to at least one kind of electrolytic

Art Unit: 1745

solutions or electrodes in a battery, among others: piperazine, pyridine, pyridine derivatives, etc. (COL 4, lines 22-30).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Kubota et al in the Li-battery cells of Hall-Smith et al-Frech et al because Kubota et al disclose that piperazina may be added to a least the electrolytic solutions for the purpose of improving a variety of characteristics for the battery such as cyclic characteristics, an over-discharge suitability, and an over-charge suitability.

22. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of Sato et al 2004/0001302.

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells*



Art Unit: 1745

*necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

***Examiner's Note:** claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

**Examiner's Note:** *since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes

Art Unit: 1745

would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

Sato et al disclose the use of styrene carbonate in electrolytes (P0060) of batteries (P0002-0003).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Sato et al in the Li-battery cells of Hall-Smith et al-Frech et al because Sato et al disclose the suitability of using styrene carbonate (the specific degassing agent) in electrolytes. Thus, Sato et al recognize the benefit of using styrene carbonate as a stable and compatible additive for electrolyte solvents.

Art Unit: 1745

23. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of the Japanese publication JP 10-040928 (heretofore the JP'928).

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion*

Art Unit: 1745

*secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the

Art Unit: 1745

cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

***Examiner's Note:*** since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

The JP'928 discloses a non-aqueous electrolyte battery e.g. lithium cell – having non-aqueous electrolyte solution in which predefined amount of a piperidine group compound is added (ABSTRACT).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of the JP'928 in the Li-battery cells of Hall-Smith et al-Frech et al because the JP'928 disclose that piperidine, when added in the electrolyte, improves discharge capacity, suppresses self discharge characteristic, and offers a high industrial value.

24. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of Chen et al 2003/0157413.

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into

Art Unit: 1745

a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).



Art Unit: 1745

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

**Examiner's Note:** *since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer

Art Unit: 1745

electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

Lucas et al disclose electrolytic processes in electrolytic cells (ABSTRACT) comprising electrolytes (COL 2, lines 43-48) comprising 2,3-dimethyl-1,3-butadiene (COL 2, lines 65-66).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Lucas et al in the Li-battery cells of Hall-Smith et al-Frech et al because Lucas et al disclose al

Art Unit: 1745

that the specific compound (the degassing agent) assists in electrolytic process that occurs in the electrolytic cell. Thus, Lucas et al contemplate the desirability of including said specific compound in the electrolytic cell regardless of the particular chemical environment or functionality of the electrolytic cell. Lucas et al is pertinent to other references as well as the field of applicant's endeavor because Lucas et al envision the use of said specific compound in electrolytic cells, and batteries or electrochemical cell are also electrolytic-based systems.

Additionally, none of the preceding references expressly discloses the specific vinyl ethylene carbonate and/or triphenyl phosphate.

Chen et al disclose Li-ion batteries with improved safety (TITLE) that utilizes one or more additives in the battery electrolyte solution wherein a Li-salt is dissolved in an organic solvent containing propylene carbonate, and a blend of triphenyl phosphate and vinyl ethylene carbonate. This blend which is an additive has been found to significantly enhance the safety and performance of Li-ion batteries (ABSTRACT/Claims 1 and 11).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Chen et al in the Li-battery cells of Hall-Smith et al and Lucas et al because Chen et al teach that their blend additive has been found to significantly enhance the safety and performance of Li-ion batteries.

Art Unit: 1745

25. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of the Japanese publication JP 10-270082 (herein the JP'082).

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion*

*secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the

Art Unit: 1745

cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

***Examiner's Note:** since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

The JP'082 discloses Li-cells or Li-ion batteries including an electrolyte salt containing styrene butadiene rubber and acrylonitrile butadiene rubber subjected to synthesis after mixture formation (ABSTRACT).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of the JP'082 in the Li-battery cells of Hall-Smith et al-Frech et al because the JP'082 discloses that it provides advantages such as aiding in raising capacitance and performance of battery; eases film forming process; suits mass production at stable quality; and facilitates thinning of electrolyte film in simple manner.

26. Claims 44-46 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 in view of Frech et al 2002/0160271 as applied to all the claims above, and further in view of Yano et al 6507378.

In relation to claim 44, 70:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into

Art Unit: 1745

a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

**Examiner's Note:** *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).



Art Unit: 1745

Smith et al further evidence Hall in that  $\text{LiPF}_6$  or  $\text{LiClO}_4$  or  $\text{LiBF}_4$  is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

As to claim 45:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

As to claims 70 and 46:

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium metal as the anode, and a lithium metal oxide such as  $\text{Li}_x\text{Mn}_2\text{O}_4$ ,  $\text{Li}_x\text{NiO}_2$ ,  $\text{Li}_x\text{CoO}_2$  as the cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

**Examiner's Note:** *since the instant claims recite that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer

Art Unit: 1745

electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that are not available with other electrolytic systems, for example, solid polymeric electrolytes would be able to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

Hall as evidenced by Smith et al and Frech et al are applied, argued and incorporated herein for the reasons discussed above. However, (*assuming arguendo that*) the preceding references do not expressly disclose the specific degassing agent (*which the Examiner does not admit*).

Yano et al discloses examples of the quality improving monomers including, among others, vinyl monomers such as vinyl pyridine, vinyl piperidon, vinyl piperazine (COL 14, lines 49-53).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of

Art Unit: 1745

Yano et al in the Li-battery cells of Hall-Smith et al-Frech et al because Yano et al makes known that the specific vinyl piperazine is a quality improving monomer material suitable for improving adhesion, cohesion and/or heat resistance. *In this case, the teachings of Yano et al are fully applicable to the preceding references as well as to the field of applicant's endeavor because Yano et al address the same problem of improving quality by using polymeric materials and/or compositions. Specifically, Yano et al attributes special characteristics to the vinyl piperazine, all of which may be extended or applied to electrolyte systems adding polymeric material(s) as claimed by the applicant.*

#### ***Response to Arguments***

27. Applicant's arguments with respect to claims 44-46 and 70 have been considered but are moot in view of the new ground(s) of rejection.

28. This office action constitutes a full and proper response to the amendment dated 05/10/07 which responded to the non-final rejection dated 11/22/06.

#### ***Conclusion***

29. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

Art Unit: 1745

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Raymond Alejandro  
Primary Examiner  
Art Unit 1745



RAYMOND ALEJANDRO  
PRIMARY EXAMINER